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# Panel: IS has outgrown the need for reference discipline theories, or has it?

Shuk Ying Ho
*The Australian National University*, susanna.ho@anu.edu.au

# OPPORTUNITIES AND CHALLENGES OF MOBILE PERSONALIZATION: AN EXPLORATORY STUDY

Ho, Shuk Ying, The Australian National University, Canberra, 0200, Australia,
susanna.ho@anu.edu.au

## Abstract

*In the decade since the creation of wireless handheld devices, mobile commerce (m-commerce) has become a ubiquitous channel for accessing information and conducting business. Mobile users can now access information anytime and anywhere. Mobile advertising, retailing, and gambling are popular, and gradually the competition among mobile services providers turns fierce. Hence, some services providers adopt personalization technologies to customize content for their users. This paper explores the opportunities and challenges of the use of personalization technologies in m-commerce. Although the effectiveness of personalization on the web is well-examined, there is little work on personalization in mobile services. The debates regarding the effectiveness of personalization and technological limitations and privacy concerns motivate us to conduct focus groups with mobile users, and explore the opportunities and challenges of personalized mobile services. The focus groups findings illustrate that mobile users are very concerned about their privacy and spam. We then extract a list of personal information from the focus groups findings. This list of personal information is highly related to mobile users' privacy concerns. We conduct an online survey to gain a better understanding of which piece of information mobile users are more willing to share with services providers and we perform a multi-dimensional scale analysis.*

*Keywords: Personalization, Mobile Commerce, Expectation, Focus Groups, Multi-Dimensional Scale Analysis*

# 1 INTRODUCTION

## 1.1 Personalization in Mobile Commerce

In the decade since its creation, mobile commerce (m-commerce) has become a ubiquitous channel for accessing information and conducting business (Allen 2003; Tarasewich et al. 2002). M-commerce is the buying and selling of products and services through wireless handheld devices (Hong and Tam 2006). These devices range from small handsets, such as cell phones and personal digital assistants (PDA), to wireless laptop computers. Apart from retailing, there are applications on mobile advertising and mobile gambling. According to Wu and Wang (2005), only 16% of half a billion Internet users were global wireless Internet users in 2001; however, the percentage jumped up to 57% of 1.5 billion Internet users in 2007. A telecommunications analyst, Paul Budde, estimated that 300 million text messages are sent by 11.5 million mobile phones over the three Australian mobile networks each month[1]. Undoubtedly, m-commerce is gaining significance.

The proliferation of wireless-based applications has turned these devices into an essential "touch point" of corporate services (Gopal and Tripathi 2006; Stafford and Gillenson 2003). With recent advances in wireless location technology, such as Global Positioning Systems (GPS), mobile operators can identify the location of a wireless device within several metres. Prior research asserts that with such a location awareness capability, this mobile channel provides firms with more valuable promotions and sales opportunities than the web channel does (Balasubramanian et al. 2002).

In leveraging the strengths of m-commerce, the question that lurks in the back of mobile operators' minds is: what type of location-based content should be delivered? With increasing customer expectations, presumably, one-message-fits-all is not a strategic move. Customers prefer customized, or even personalized, services (Blom and Monk 2003). Tailoring the content in relation to users' locations (and even their preferences, shopping goals and context) is necessary in order to realize business opportunities in m-commerce. Thus, personalization is the answer for mobile operators.

Personalization is to tailor content to the needs of individual consumers. The technology enabler, a personalization agent, is a collection of software modules that deploys tools to collect and analyze customers' behavior and their purchase transactions. These modules, including data mining, collaborative technology, click stream analysis components, and pattern recognition, allow real-time detection of user behavior and manipulation of web content (Ardissono et al. 2002). The agent is a context-aware application designed to deliver targeted promotions to online users about the products they like and protect them from information overload. Providing responsive and high quality services is a key factor for firms to achieve a sustainable competitive advantage. The goal of personalization is to leverage the above technologies to provide the right content in the right format to the right person at the right time in the right location. That said, not only are firms now able to retrieve the profile of a user when the user accesses a service, they are also able to change the content and its format adaptively according to the timing and the context of interaction (Fan and Poole 2006).

On the web channel, web personalization is found to be a very useful approach to facilitate customers' decision making (Tam and Ho 2006). If personalization is applied in m-commerce, many business opportunities are available. One popular application is mobile advertising. Mobile services providers use a short message service (SMS) to send messages to their subscribers. The message content can be an advertisement or a cash coupon. Consider the following scenario: mobile operators learn a user's preferences with regular surveys, and cooperate with different business partners to offer trade

[1] See: http://www.consumer.vic.gov.au/CA256902000FE154/Lookup/CAV_Publications_Reports_and_Guidelines/$file/mcommerce.pdf

promotions. With GPS, mobile operators detect the location of a cell phone user. This user is fond of Chinese food (i.e. user's preference). It is about lunch time (i.e. time and goal), and she is now near Chinatown (i.e. location). If the operators send her a mobile coupon (e.g. 10% discount in The Dragon Restaurant) in the form of SMS and she can enjoy the discount by simply showing this SMS to the waiter, then this can greatly increase the chance of her having lunch there.

Location-based services can be classified into various categories (Rao and Minakakis 2003). The first category is "where am I?" services. They relate to information about users' locations and navigations. After detecting where service clients are, service providers can send information such as maps, driving directions and yellow-page listings to service clients. The "where am I?" services are also adopted by drivers. The second category is point-of-need information delivery. Service providers send product information and promotions to service clients. To personalize the information, the providers not only need to know the clients' location, but also access their preference profiles. The example of The Dragon Restaurant belongs to this category. The third category is industrial/corporate applications, which are business-to-business oriented. Barcode scanners become the technology enablers for firms to track materials and product movements. Location-based services can be incorporated in the supply chain management and asset management, and location-specific task checklist and real time reports can be sent to workers. Table 1 presents a summary. The first and the second categories are the focus of this research.

| **Category of Location-Based Services** | **Business Model** | **Information Used by Service Provider** | **Examples** |
|---|---|---|---|
| "Where am I?" | B2C | Client's location | Maps, navigation systems |
| Point of need info delivery | B2C | Client's location & preferences | Mobile coupons, shopping recommenders |
| Industrial / Corporate applications | B2B | Material's location & operational resource networks | Supply chain management, asset management systems |

*Table1. Summary of Three Categories of Location-Based Services*

### 1.2 Motivations and Research Questions

Mobile services providers adopt personalization technologies with the intention to better communicate with their users and to generate more business opportunities. The impact of personalization in m-commerce is under-investigated. Generally speaking, we believe personalization can increase the value of an organization by focusing on customer intimacy, but at the same time, it leads to users' concerns.

With the gaining popularity of wireless handheld devices, this paper examines the use of personalization technologies in m-commerce. We are going to address the following research questions:

1. What business opportunities are offered by personalization in m-commerce?
2. What are major challenges to personalized mobile services?

The paper is organized as follows: In Section 2, we review the literature of personalization. Section 3 outlines the methodology, and Section 4 presents the focus groups findings. With the insights brought by the focus groups, a survey was conducted. Section 5 presents the survey and the findings. Section 6 discusses the findings and the last section concludes the paper.

## 2 LITERATURE REVIEW

The use of personalization in web-based applications has been widely examined. Several authors have found evidence for the effective influence of personalization on users' decision making (Kumar and

Benbasat 2006; Tam and Ho 2006), as well as for perception of e-services (Nysveen and Pedersen 2004). By providing individualized content, offers and services, personalization eliminates aimless surfing activities (Shahabi and Banaei-Kashani 2003), eases business-to-consumer interaction (Ardissono et al. 2002) and increases users' satisfaction (Liang et al. 2007). Also, personalizing content empowers firms to deliver customer value and to achieve profitable growth. It is reported that online retailers using personalization technology have had significant revenue increases.

While much prior work examines web personalization, the current work focuses on personalization in m-commerce. Personalization in m-commerce refers to the process of adapting content with the dual objectives of serving users' needs as well as maximizing business opportunities. In general, it can take three forms:

(1) User-driven personalization – A user specifies in advance the desired layout and content that match his/her interests and preferences. For example, an investor would like content on a financial portal tailored to his own investment portfolio. The goal is to provide tools and options for users to customize the available information and the presentation format.

(2) Transaction-driven personalization – Similar to the previous case, customized layout and content are generated by the online merchant. In the transaction-driven context, personalization is driven by previous transactions rather than specified by the user in advance (Al-Natour et al. 2006; McGinty and Smyth 2006; Wei et al. 2008). For example, page organization and information indexing of mobile sites is automatically adjusted for different users depending on their preferences as inferred from previous transactions.

(3) Context-driven personalization – In this case, a very adaptive mechanism is employed to customize content and layout for each individual user. The mechanism is sensitive to the context of the interaction and users' location, and adapts to the context in real-time. Advances in click analysis and text mining have made it possible to understand the context and to infer the processing objective of the user in real time. For example, context-sensitive persuasion messages in the form of cash coupons are dynamically generated and sent to users via SMS to realize cross-selling and up-selling opportunities.

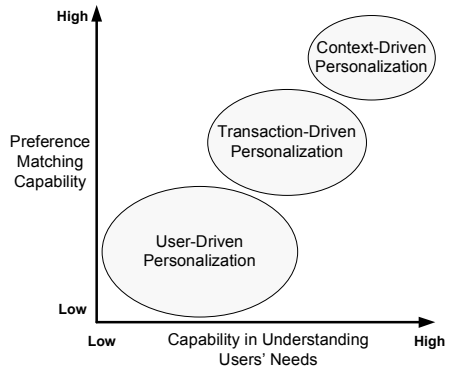



*Figure 1. Different Types of Personalization Technologies.*

Figure 1 summarizes different types of personalization technologies. The size of the bubbles reflects the usage in B2C commerce. While transaction-driven personalization is common at the current moment, we expect widespread adoption of context-driven personalization in the future, as mobile services providers can harness the power of GPS technologies, and take users' location and contexts into consideration.

But still, there remains skepticism on the prospects of personalization. Several personalization initiatives have failed without generating any benefits to the adopting firms. One main reason for such failures is inappropriate resource allocation. Chellappa and Sin (2005) claim that investments in online personalization services may be severely undermined if online users do not use these services due to privacy concerns. Nantel and Sekhavat (2008) suggested that the effects of SMS advertising depend

very much on the languages used in SMS and the receivers. This motivates us to conduct focus groups with genuine mobile users to explore business opportunities and possible challenges.

# 3 METHODOLOGY

We conducted a number of focus groups to explore mobile users' concerns and expectations of personalized mobile services. They were dual-moderator focus groups. That is, there were two moderators. One moderator ensured the session progressed smoothly, while another ensured that all the topics were covered. The reason for adopting this approach is that focus groups are likely to bring to light the collective views of mobile users and are effective in producing richer data because of interaction (Bryman 2001; Cooper and Schindler 2008 p. 177).

## 3.1 Participants and Research Design

We conducted six focus group sessions comprising 48 students from a university in Australia. We considered students to be appropriate participants, because they were typical mobile services users. The sessions were held in the university during the second week of October 2007. Sessions were recorded and transcribed to produce qualitative data for subsequent analysis. In this study, we followed the general guidelines of focus group research closely (Fern 2001). Each session comprised four to six students.

The participants we selected were all mobile phone users. There were 29 females and 19 males. Their average age was 21. On average, they had subscribed to mobile services for at least five years. Thus, they had reasonable knowledge of mobile services. A moderator who had performed a similar role in previous research ran the focus groups. The main role of the moderator was to facilitate useful and relevant discussions among group members. We encouraged participants to freely express their views since their identities would remain anonymous throughout the data collection and analysis processes. The questions were open-ended. The focus group questions included "What is mobile-commerce?", "In your opinion, what are personalized mobile services?", "Why do you use personalized mobile services?", and "What possible reasons may discourage you to use personalized mobile services?". For example, we asked students their perceptions of mobile services, whether they would use personalized mobile services, and their concerns. Each focus group lasted approximately 1.5 hours.

## 3.2 Data Coding and Analysis

After the data were recorded, they were transcribed immediately to allow for coding and analysis. The data analysis involved rigorous examination of extensive focus groups transcripts. We compared, conceptualized and categorized our data. Coding categories reflected the interpretations that focus group participants formed about m-commerce. We eventually arrived at ten fundamental attributes. The data suggested most participants we talked to were curious about and had high expectations for personalized mobile services, however, they expressed strong privacy and security concerns. The concepts and patterns observed were linked to the IS literature. We endeavored to provide a data-theory link (Klein and Myers 1999) and attempted to understand participants' perceptions of personalized mobile services that are associated with the theory. In order to reduce researchers' bias and also to validate that no important attributes had been missed in the result summaries, a colleague was asked to comment on the analysis of the data. This allowed the incorporation of two different perspectives for our results and minimized the potential that we might have overlooked something important. The role of this colleague was to "bring a different and possibly more objective eye to the evidence" (Eisenhardt 1989 p. 538). The information this colleague received did not include the field researcher's list of attributes. We went through the focus group transcripts several times and moved back and forth between the data, IS literature and the concepts emerged.

# 4 FINDINGS

In the following, we will present the conceptualization and categorization of the data in our final round. There are ten major categories.

## 4.1 Technological Issues

This category focuses on the technological aspects of personalized mobile services. It covers performance of personalization and mobile interfaces.

### *4.1.1 Location-Related Functions*

Most focus group participants suggested that the major use of personalization was to meet their instant needs. Personalized mobile services act as a recommender, and this aligns with personalization literature (e.g. Gretzel and Fesenmaier 2006). Weather report, stock prices, restaurant recommendation and movie listings are typical examples of instant services. For instance, one participant used the mobile devices to "check the weather forecast". Another participant mentioned, "I got an SMS from restaurants, stock exchanges and other service providers. Sometimes reading them is quite interesting and it's always good to get some valuable information for free." However, the participant highlighted that, "I don't want them to send me junk SMS everyday." Mobile services are useful for impulse purchase as well. One participant said, "when you go to the star bucks in the US, and if you like the music playing there, you can download it to your mobile phone". Participants also tended to focus on hedonic activities, such as "discount sales" and "social events".

Traffic updates are considered to be very useful mobile services. For instance, one participant mentioned that "maybe personalized services can be location based in such a way that tells us where the nearest petrol station is and also list out the one that's offering the best price". Another said that "I use it for traffic updates back home in Malaysia and it is a very helpful service". The main advantage of using location-based mobile services was "convenience". One participant said, "If I get the level of personalization it'll be good and it'll save me a lot of time."

### *4.1.2 Personality-Related Functions*

Focus group participants gave suggestions on location-based mobile services. For instance, a few participants suggested personalized mobile services could take more variables on customers' characteristics, in particular personality traits, into consideration. One said, "SMS advertising should be related to my character and it should be things that match my personality, but in order for them to know that, we must provide them with that information". And another participant mentioned that "I know some other websites that take personalization to the next level and actually study your personality and base their advertisements on your past preferences". This echoes the findings from the work by Moon (2002) who empirically showed that a match between users' personality and personalization strategies improves the effectiveness of the strategies.

participants pointed out that emotions and moods are important variables for individuals to make decisions on purchases. One participant said, "Maybe if they sent me a listing of movies that is in some language I don't understand. But ultimately, it depends on my mood if I want to watch it or not." This indicates that users' preferences and peripheral user parameters (e.g. spoken language) may not be the only factor to be considered in personalization, and users' moods and emotions, which are fuzzier, are useful in personalization. However, some participants thought that it was not easy to detect individuals' emotions and moods with mobile devices.

### *4.1.3 Technological Limitations*

(a) Feasibility of Predicting What Users Want

Although there is a significant amount of "hype" about what sort of personalized mobile services will be useful, most participants were not optimistic about the feasibility of location-based personalization. Some participants did "not like to be categorized and put into a frame". Some emphasized that individuals' preferences were changing constantly, and thus, hard to predict. For instance, one participant said, "I think that personalization takes too much time and my preferences can change", and another participant mentioned that "some people don't exactly know what they want or what they want to do. So they cannot give accurate information".

(b) Small Screens and Limited Display

One major limitation of wireless handheld devices was small screens. One participant said that "the screens are too small to surf the internet". Another participant mentioned that "some websites are not designed to fit on the mobile screen even if it's a PDA". This aligns with the suggestions by a participant, who said that "I don't like phone advertising mainly because it's so small and I prefer pictures, color and motion. SMS is so boring. Advertising is creative and so should be the advertisements". Although the screens are small, participants expected more information to be packed on the screen. For example, one participant expected a rating system. That is, there are "a green-light or a red-light to show the importance [of the recommendations]", and this type of color code is expected to "be standardized among the service providers". This dilemma aligns with an IS research stream which explores increasing the usability of small screens (e.g. Kumar et al. 2004; Lee and Benbasat 2004).

(c) Security Issues

The increasing attacks on mobile devices by malicious hackers heighten individuals' awareness of security. Individuals are concerned about how data are stored at mobile devices and how data are transferred across the wireless channels. Participants were concerned about "identity theft", which they considered to be "a major issue right now" and "viruses that [might] be downloaded into the mobile phone". One participant questioned, "I would like to know that all the information that the service providers have about me, is it safe?"

Security concerns discouraged individuals from using mobile services in general. For instance, one participant said, "Occasionally when I want to share a picture I send an MMS or sometime use the Bluetooth transfer. But I keep it off most of the time because hackers are always on the look out. So I keep it off for security reasons." Another participant mentioned that "I wouldn't use services like gambling because I don't know what the source of the message is. One participant said, "there is always an issue if these service providers sell your information to third parties. It is illegal but it still does happen on a very large scale. Sometimes employees from within the company who have access to all this information can sell it illegally."

People have serious concerns about the security of mobile devices, because mobile devices play a central role in daily life. One participant said that, "if someone hacks into my mobile phone or if I lose my mobile phone, they get details about my entire life."

## 4.2 Social Issues

### *4.2.1 Opt-Out Options*

Participants showed a considerable amount of concern about how these personalized mobile services should be regulated. For instance, giving users an option to opt-out is important. One participant questioned, "Will I be able to de-activate the service?" Since mobile communication plays a

significant role in our daily lives, it is not easy for customers to switch off the phone to stay away from spam. Hence, participants highlighted that what users could do is to "just turn off the service not the phone".

#### *4.2.2 Privacy Concerns*

Individuals are concerned about their privacy. Most participants did not want to be tracked, and considered that personalization technologies may "abuse" their personal data. This aligns with the findings from prior IS work (e.g. Awad and Krishnan 2006). Some participants suggested that "the thought of the service provider being able to track your exact location is kind of scary." They preferred simpler services to make their lives private. One said, "I think I'd rather get an incomplete service and keep my life private." Another mentioned that "I think services should be personalized to some degree but it should not go over the limit where privacy issues are violated. Maybe it should just stay as it is right now. Just give me the information and I will decide what I want at that time." Some even questioned, "Wouldn't that be a bit dodgy if they knew where you are at all times?" Another said, "If that got really specific and if it could actually predict exactly what I want and what I like, I think it'll be kind of spooky".

#### *4.2.3 Spam*

Users dislike spam. Some participants got annoyed "when getting five to six of the same messages". Some participants indicated that they simply "ignore all those kinds of SMS advertisements". One participant said, "I heard that they get your number and send start sending you spam." Users can subscribe to personalized mobile services free of charge; however, if they find that there is spam, users cannot stop the spam unless they pay a fee to the services providers. Hence, users are worried about the "hidden charge".

### 4.3 Economical Issues

Price is a major concern. The participants tended not to use "mobile services that cost extra money". One participant thought that personalized mobile services might incur extra costs, and hence, "it's a bit too expensive". Other participants said that personalized mobile services are "cool but expensive". Some participants said that "if the price wasn't a major factor, I think it definitely draws attention". Users are uncertain of the prices, and their worry about being over-charged is another reason for them to reject mobile services. One participant said, "the most important thing is I don't know how much it costs to send the message."

If the services are provided by the Internet and by mobile services, the services on the Internet are usually free of charge. Hence, the Internet is a major threat to personalized mobile services. One participant said that "I remember when the soccer world cup was on, you could get the highlights each day on the mobile phone and that cost $60 a month which is quite expensive. You can do the same thing online for free." Participants tended to "subscribe to the advertisements on a website from a company", rather than receive personalized mobile messages. Another participant said, "Well, Google maps is slower compared to the GPS. But if it is a cheaper way then I'll use the cheaper way".

### 4.4 Firm-Customer Relational Issues

Participants did not trust mobile services providers, and they thought that personalized content presented by mobile services provider is "not neutral". They considered "profit-making" to be the major objective of mobile services providers. One participant said, "I don't know if I can ever trust a service provider because at the end all that they want is profit. Maybe if all this was supervised by the government, then there would be some sense of security". Most participants considered that mobile services providers might bias the information. One participant said, "I am mainly concerned if the

personalized information I receive is actually neutral and not biased by the advertiser". Another said, "I think that some advertisers make things that you don't like sound like things that you do like." This aligns with the findings that perceived "honesty" of services is crucial (Priester and Petty 1995).

One participant pointed out some tricks played by mobile services providers. He said, "when I'm at home, I use the free SMS service from a website. But there are some dodgy ones that keep sending you advertisements once you sign up with them. And to stop the advertisements, you need to send them an SMS which costs you $10." These tricks, undoubtedly, arouse the concerns of individuals. These interesting findings echo prior research (e.g. Komiak et al. 2005; Komiak and Benbasat 2006) who emphasized the role of trust in a personalization agent in B2C commerce.

Some participants suggested that a contract on how mobile services providers use customers' data is important. This helps customers develop a trusting relationship with mobile services providers. For instance, one participant said, "Well, I guess there would be some contract which says that they wouldn't use the information for any other purposes." Another participant pointed out, "I think companies must sign a confidentiality contract with the customers so that customers can trust the service provider. And once the contract is signed, the customer can give all the information that the provider requires." But a participant also suggested that customers had the responsibility to "read the terms and conditions when they sign up for a service."

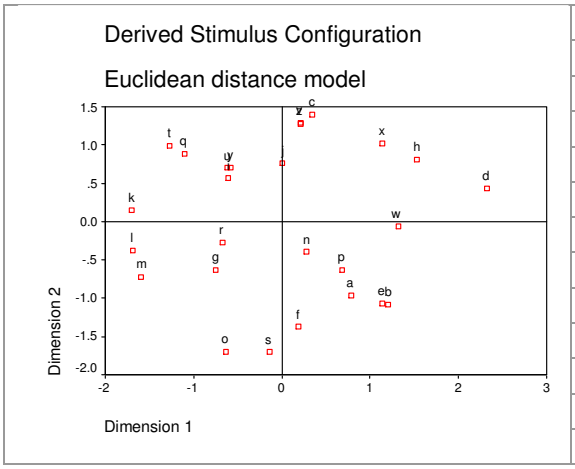
# 5 A SURVEY

The findings of the focus groups illustrated that individuals were concerned about their privacy. Some of them were unwilling to be profiled and tracked. This motivates us to conduct a survey to gain a better understanding of what personal data they are willing to share with mobile services providers in return for personalized mobile services.

A self-administrated online survey was conducted. Apart from demographic questions, the questionnaire consisted of 26 questions referring to 26 personal information attributes. We extracted these 26 information attributes[2] based on the focus group findings. Subjects were asked to assess seven aspects of information nature. For each piece of information, we provided the participants with seven statements, and asked them to evaluate each of the 26 attributes on a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). The seven statements were: (1) this information is necessary for mobile personalization; (2) this information can improve the personalization quality, (3) this information reflects the uniqueness of a customer, (4) it is necessary for mobile services providers to get an updated information from customers regularly; (5) sharing this information will increase mobile users' risks, (6) sharing this information will infringe on customers' privacy; and (7) customers are willing to share this information with mobile services providers. The time required to complete the whole questionnaire was 20 minutes.

We posted the survey in five online forums for three weeks. The participation was voluntary and anonymous. We received 81 responses. There were 46 females and 35 males. Their average age was 29. We calculated the average score for each aspect of each personal information attribute. With the average score, we conducted a multi-dimensional scale (MDS) plot (Figure 2).

[2] The 26 attributes are name, nickname, age, gender, date of birth, monthly salary, current location, preferred spoken/written language, preferences for food, preferences for music, previous purchases, home address, home activities, working address, working time, professional field, countries you plan to travel to, hobby, identity document details, financial details, income, leisure time, best friend's name, best friends' dates of birth, family members' names, and family members' dates of birth.




| | | | |
|---|---|---|---|
| A | Age | N | Gender |
| B | Leisure time | O | Spoken/written language |
| C | Education background | P | Nickname |
| D | Hobby | Q | Financial details |
| E | Date of birth (DOB) | R | Family members' DOB |
| F | Current location | S | Countries for future travels |
| G | Best friends' DOB | T | Identity document details |
| H | Previous purchases | U | Working address |
| I | Home address | V | Preferences for food |
| J | Preferences for music | W | Professional field |
| K | Working time | X | Home activities |
| L | Best friend's name | Y | Income |
| M | Family members' names | Z | Name |

*Figure 2. Multi-Dimensional Scale Plot with 26 Personal Information Attributes*

We arrived at a 2-dimensional plot. By analyzing the attribute pattern, dimension 1 (i.e. x-axis) referred to the importance of the attributes. For instance, hobby (d) and previous purchases (h) were found to be important attributes for mobile personalization. Family members' names (m), the best friend's name (l) and working time (k) were found to be less important in the personalization process. The x-axis dimension gives insights to mobile services providers on what questions they should ask their customer to collect rich and useful information for personalization.

Dimension 2 (i.e. y-axis) referred to the inverse of risk and privacy concerns. Sharing users' attributes, such as education background (c) and preference for food (v), with mobile services providers were found to be less "risky". There was a higher concern if users were asked to share information such as current location (f) and family members' names (m). The y-axis dimension tells mobile services providers that mobile customers may be hesitated to answer some questions from the providers.

The interesting part is the top-right quadrant. Attributes falling into this quadrant are useful for personalization, but users tend not to answer questions on these attributes because of privacy concerns. Mobile services providers can explore personalization methods, e.g. collaborative filtering or data mining, to draw an inference on these attributes, rather than to ask users directly.

# 6 DISCUSSION

While prior research has shown that personalization is effective in influencing users' information processing in the Internet, our understanding of its effectiveness in m-commerce is far from conclusive. This research aims to bridge the gap between the potential growth of mobile personalization and the lack of understanding of mobile users' expectations. No prior IS research, of which the investigators are aware, examines this issue. This research conducts focus groups with mobile users, and our results can also provide implications to firms on how to leverage mobile personalized services to improve their service quality, resulting in higher customer satisfaction.

First, it is a pioneering effort to examine the location dimension in personalization research. Personalization of IT services intends to provide the right content in the right format to the right person at the right time in the right location. Recent research on personalization has focused on content personalization (e.g. Tam and Ho 2006) and adaptive interfaces (e.g. Billsus et al. 2002). Little work has been done on the location dimension. Since the success of personalization in m-commerce hinges on an understanding of the context of interaction which is location sensitive, it is imperative to understand whether individuals are willing to share location-related information with mobile services providers and what potential location-based personalized services can be offered. Together these dimensions (user preferences, content, layout, and location) capture many of the functionalities of

personalization and user characteristics at a particular instant. This represents a formal characterization of the notion of personalization.

Second, while personalization has been shown to be effective in influencing user behavior, its use should be balanced by taking a proactive approach to protecting data privacy on the user side. Our findings provide a better picture of users' privacy concerns. Prior IS work (e.g. Awad and Krishnan 2006; Chellappa and Sin 2005) confirmed that users are concerned about their privacy being compromised by the personalization process. However, there is little information which mobile users are willing or unwilling to share with the services providers. Our work fills the gap by identifying 26 pieces of information that mobile users are concerned about. We conducted a survey and asked mobile users to comment on these 26 pieces of information. With an MDS plot, we identified some patterns. Mobile services providers should ensure fair access to individuals' personally identifiable information and should provide a mechanism for users to change inaccurate or unauthorized personal information conveniently and quickly. Acceptable criteria for "opt-in" and "opt-out" should be provided as consumer privacy options. Our MDS plots provide insights for mobile services providers on mobile users' focus of the mechanism implementation.

# 7 CONCLUSION

The role of personalization in m-commerce is gaining significance. Conducting focus groups with mobile users allowed us to gain a deeper understanding of their expectations and concerns for personalized mobile services. On one hand, users look for accurate, high-quality personalized services. On the other hand, users are concerned about security, privacy and spam. Based on the focus groups results, we conducted a survey and asked mobile users which personal information they are willing to share with mobile services providers. Our results provide mobile services providers with valuable knowledge on how to strike a balance between effectively leveraging location-detection features and easing users' privacy concerns.

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